

Mark Scheme

Sample Assessment Material

GCSE

GCSE in Mathematics Specification B
Higher Tier

Unit 2: Number, Algebra and Geometry 1
(Non-Calculator)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear

Comprehension and meaning is clear by using correct notation and labelling conventions.

ii) select and use a form and style of writing appropriate to purpose and to complex subject matter

Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

Guidance on the use of codes within this mark scheme
M1 - method mark
A1 - accuracy mark
B1 - working mark
C1 - communication mark
QWC - quality of written communication
oe - or equivalent
cao - correct answer only
ft - follow through
sc - special case

Unit 2 Higher Tier: Number, Algebra, Geometry 1

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
1. (a)	$84 = 2 \times 42$ $= 2 \times 2 \times 21$ $= 2 \times 2 \times 3 \times 7$ OR Use of factor trees	$2 \times 2 \times 3 \times 7$	2	M1 for a systematic method of at least 2 correct divisions by a prime number or an equivalent factor tree or a full process with one calculation error A1 for $2 \times 2 \times 3 \times 7$ or $2^2 \times 3 \times 7$
(b)	LCM of 4, 6 and 8 is 24 OR Red = after 4, 8, 12, 16, 20, 24, 28, Blue = after 6, 12, 18, 24, 30, 36, White = after 8, 16, 24, 32, 40, OR Table of times from midday onwards into the next day, with indication when a red, blue and white pill are to be taken.	Midday on the following day	2	M1 for an attempt to find the LCM A1 for midday (or equivalent) the next day OR M1 for listing multiples of 4, 6 and 8 A1 for midday (or equivalent) the next day OR M1 for a correct timetable showing when pills are taken A1 for midday (or equivalent) the next day
				Total for Question: 4 marks

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
2.	<p>Colin saves $\frac{1}{1+9} = \frac{1}{10}$ of his wage</p> <p>Anwar saves 12%, Bethany saves $1 - \frac{7}{8} = \frac{1}{8}$ of her wage</p> <p>$\frac{1}{10} = 0.1$, 12% = 0.12, $\frac{1}{8} = 0.125$</p> <p>OR</p> <p>$\frac{1}{10} = 10\%$, 12%, $\frac{1}{8} = 12.5\%$</p> <p>OR</p> <p>Let the weekly wage be £100 say</p> <p>Colin saves $\frac{1}{1+9} = \frac{1}{10}$ of his wage</p> <p>Anwar saves 12%, Bethany saves $1 - \frac{7}{8} = \frac{1}{8}$ of her wage</p> <p>$\frac{1}{10}$ of £100 = $\frac{1}{10} \times 100 = 10$</p> <p>12% of £100 = $\frac{12}{100} \times 100 = 12$</p> <p>$\frac{1}{8}$ of £100 = $\frac{1}{8} \times 100 = 12.5$</p>	Bethany	4	<p>B1 for $\frac{1}{1+9} = \frac{1}{10}$</p> <p>B1 for $1 - \frac{7}{8} = \frac{1}{8}$</p> <p>M1 for conversion to a decimal or 0.1 or 0.12 or 0.125 seen</p> <p>A1 cao for Bethany</p> <p>OR</p> <p>M1 for conversion to a percentage or 10% or 12.5% seen</p> <p>A1 cao for Bethany</p> <p>OR</p> <p>B1 for $\frac{1}{1+9} = \frac{1}{10}$ [or M1 for $100 \div (1+9)$]</p> <p>B1 for $1 - \frac{7}{8} = \frac{1}{8}$ {or A1 ft for £100 - "£87.50" (= £12.50)}</p> <p>M1 for $\frac{1}{10} \times 100 (=10)$ [or A1 for 10] or $\frac{12}{100} \times 100 (=12)$</p> <p>or $\frac{1}{8} \times 100 (=12.5)$ {or $\frac{7}{8} \times 100 (=87.5)$}</p> <p>A1 cao for Bethany</p>
Total for Question: 4 marks				

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
3.				
(a)		$3n + 2$	2	B2 for $3n + 2$ or equivalent [B1 for $3n + k$ where $k \neq 2$]
(b)	$3 \times 42 + 2 = 3 \times 16 + 2 = 48 + 2$	50	2	M1 for $3 \times 42 + 2$ with a clear intention to square the 4 independent of the scalar 3. A1 cao
Total for Question: 4 marks				
4.	<p>Angle PQR = angle QRS = $\frac{10}{(10 - 2) \times 180} = 144^\circ$ (interior angle of an n-sided polygon)</p> <p>Angle QPR = angle QRP = $\frac{180 - 144}{2}$ = 18° (base angles of isos triangle)</p> <p>Angle PRS = $144 - 18 = 126^\circ$ $x = 180 - 126 = 54^\circ$ (angles on a straight line)</p>	54°	5	<p>M1 for $\frac{(10 - 2) \times 180}{10}$ oe</p> <p>A1 for interior angle = 144</p> <p>M1 for $\frac{180 - 144}{2}$ or 18° seen</p> <p>M1 (dep) for "$180 - ('144' - '18')$" A1 cao</p>
Total for Question: 5 marks				

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
5. OWC (i, ii, iii) FE	<p>(a)</p> <p>Wall area = $330 \times 40 + 90 \times 30 = 13200 + 2700 = 15900 \text{ cm}^2$</p> <p>Tile A area = $10 \times 10 = 100 \text{ cm}^2$</p> <p>No of tiles = $15900 \div 100 = 159$</p> <p>No of boxes needed = 8 ($20 \times 8 = 160$ tiles)</p> <p>$\text{£}9.99 \times 8 = \text{£}79.92$</p> <p>Tile B area = $15 \times 15 = 225 \text{ cm}^2$</p> <p>No of tiles = $15900 \div 225 = 70(225 \times 70 = 15700) + 1$</p> <p>No of boxes needed = 6 ($12 \times 6 = 72$ tiles)</p> <p>but some tiles will need to be cut, so 7 boxes needed</p> <p>$\text{£}11.49 \times 7 = \text{£}80.43$</p> <p>OR</p> <p>$330 \div 10 = 33$ A tiles per long row</p> <p>$40 \div 10 = 4$ long rows</p> <p>$33 \times 4 = 132$ tiles</p> <p>$90 \div 10 = 9$ tiles per short row</p> <p>$30 \div 10 = 3$ short rows</p> <p>$9 \times 3 = 27$ tiles</p> <p>$132 + 27 = 159$ tiles</p> <p>No of boxes needed = 8 ($20 \times 8 = 160$ tiles)</p> <p>$\text{£}9.99 \times 8 = \text{£}79.92$</p> <p>$330 \div 15 = 22$ B tiles per long row</p> <p>$40 \div 15 = 3$ long rows (1 row of tiles will be cut)</p> <p>$22 \times 3 = 66$ A tiles</p> <p>$90 \div 15 = 6$ tiles per short row</p> <p>$30 \div 15 = 2$ short rows</p> <p>$6 \times 2 = 12$ tiles</p> <p>$66 + 12 = 78$ tiles</p> <p>No of boxes needed = 7 ($12 \times 7 = 84$ tiles)</p> <p>$\text{£}11.49 \times 7 = \text{£}80.43$</p>	<p>Tile A is the most economical</p>	6	<p>M1 for either 330×40 or 90×30 or 10×10 or 15×15</p> <p>A1 for 15900 and (100 or 225)</p> <p>M1 for $15900 \div 100$ or $15900 \div 225$</p> <p>A1 ft for 10 A boxes needed ($'15900' \div '100'$) $\div 20$ rounded up to nearest whole number) or 7 B boxes needed ($'15900' \div '225'$) $\div 12$ rounded up to nearest whole number)</p> <p>B1 for answers or $\text{£}79.92$ and $\text{£}80.43$ to justify the choice</p> <p>C1 for comment on the need to cut some Type B tiles QWC: Decision must be stated, with all calculations attributable</p> <p>OR</p> <p>M1 for $330 \div 10$ or $90 \div 10$ or $330 \div 15$ or $90 \div 15$</p> <p>A1 for (33 and 9) or (22 and 6)</p> <p>M1 for $33 \times 4 + 9 \times 3$ or $22 \times 3 + 6 \times 2$</p> <p>A1 ft for 10 A boxes needed ($'33 \times 4' \div '9 \times 3'$) $\div 20$ rounded up to nearest whole number) or for 7A boxes needed ($'22 \times 3' \div '6 \times 2'$) $\div 12$ rounded up to nearest whole number)</p> <p>B1 for answers or $\text{£}79.92$ and $\text{£}80.43$ to justify the choice</p> <p>C1 for comment on the need to cut some Type B tiles QWC: Decision must be stated, with all calculations attributable</p>

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
5.	(b) The carton can have dimensions 42 cm × 31.5 cm × 21 cm or 63 cm × 21 cm × 21 cm or 84 cm × 31.5 cm × 10.5 cm or 63 cm × 42 cm × 10.5 cm or 126 cm × 21 cm × 10.5 cm	Net	3	B1 for quoting a correct set of dimensions (could be simply on the diagram) M1 for a net showing 6 rectangles that could form a cuboid A1 for an accurate scale drawing or lengths labeled accurately
Total for Question: 9 marks				
6.	(a)	$4p(2pq + 3)$	2	B2 for $4p(2pq + 3)$ [B1 for $2p(2pq + 6)$ or $4(p^2q + 3p)$ or $p(4pq + 12)$ or $2(2p^2q + 6p)$]
	(b)	$11 - 2m$	2	M1 for $5 - 2m + 6$ A1 cao
Total for Question: 4 marks				
7.	(a) Table of values $x = -1 \quad 0 \quad 1 \quad 2 \quad 3$ $y = -4 \quad 1 \quad 6 \quad 11 \quad 16$ OR Using $y = mx + c$, gradient = 5, y- intercept = 1	Single line from $(-1, -4)$ to $(3, 16)$	3	B3 for a correct single line from $(-1, -4)$ to $(3, 16)$ [B2 for at least 3 correct points plotted and joined with line segments OR 3 correct points plotted two of which must be the extremes with no joining OR a single line of gradient 5 passing through $(0, 1)$ B1 for 2 correctly plotted points OR a single line of gradient 5 OR a single line passing through $(0, 1)$
	(b)	D	1	B1 cao
	(c) Gradient = $-\frac{1}{5}$, $c = 0$	$y = -\frac{1}{5}x$	2	M1 for $y = -\frac{1}{5}x + c$ A1 cao
Total for Question: 6 marks				

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
8.	<p>Volume of water in pool when full</p> $= \frac{(2+1)}{2} \times 12 \times 4 = 72 \text{ m}^3$ <p>= 72 000 000 cm³ (ml)</p> <p>Time to fill pool</p> $= 72\,000\,000 \div 200$ $= 360\,000 \text{ seconds}$ $= 360\,000 \div 60 = 6000 \text{ mins}$ <p>= 100 hours</p>	100 hours or 4 days and 4 hours, Friday 13 00	6	<p>M1 for $\frac{(2+1)}{2} \times 12$</p> <p>A1 for 72 m³</p> <p>B1 for 72 000 000 cm³ (ml) or multiplying volume by 1 000 000</p> <p>M1 for "72 000 000" ÷ 200</p> <p>M1 for "360 000" ÷ 3600</p> <p>A1 for 100 hours or 4 days and 4 hours, Friday at 1300</p> <p>[B1 for an answer left as 360 000 seconds, if the last M1 not awarded]</p>
Total for Question: 6 marks				
9.	<p>(i) $\left(\frac{3}{1}\right)^2 \text{ or } \left(\frac{1}{9}\right)^{-1}$</p> <p>(ii) $\left(\frac{3}{1}\right)^2 \text{ or } \left(\frac{1}{9}\right)^{-1}$</p> <p>(iii) $(16)^{\frac{3}{2}} = (\sqrt{16})^3$</p>	<p>1</p> <p>9</p> <p>64</p>	<p>4</p> <p></p> <p></p>	<p>B1 cao</p> <p>B1 cao</p> <p>B2 cao</p> <p>[B1 for $(16)^{\frac{3}{2}}$ or equivalent]</p>
Total for Question: 4 marks				
10.	$\frac{x+3}{4} + \frac{x-5}{3}$ $= \frac{3(x+3) + (x-5)}{12}$	$\frac{7x-11}{12}$	3	<p>M1 resolution of denominator to 12</p> <p>M1 expansion and simplification of brackets</p> <p>A1 cao</p>
Total for Question: 3 marks				

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
11. QWC, (i, ii, iii)	<p>PS = PT and PQ = PR (equal tgts from a point) Let angle SPT = x Angle PST = angle PTS = $\frac{180 - x}{2}$ (base angles of isos triangle) Angle QPR = x (vertically opposite angles) Angle PQR = angle PRQ = $\frac{180 - x}{2}$ (base angles of isos triangle) Therefore angle PQR = angle PTS which are alternate angles. Hence QR is parallel to ST</p>	Proof	5	<p>B1 for PS = PT or PQ = PR B1 for equal tangents from a point</p> $\frac{180 - x}{2}$ <p>B1 for angle PST = angle PTS = $\frac{180 - x}{2}$ or angle PQR = angle PRQ = $\frac{180 - x}{2}$</p> <p>C1 for base angles of isos triangle are equal or vertically opposite angles are equal QWC: Working should be clearly laid out in a logical sequence, with calculations attributable</p> <p>C1 for alternate angles implying parallel QWC: Any technical language should be correct</p>
Total for Question: 5 marks				

5MB2H				
Question	Working	Answer	Mark	Additional Guidance
12.	$A = 3(x+1)(2x+7) - (x-4)(x+1)$ $= 3(2x^2 + 9x + 7) - (x^2 - 3x - 4)$ $= 5x^2 + 30x + 25$ <p>Factorising gives</p> $5(x+1)(x+5)$ <p>OR</p> <p>Splitting shape A into rectangles, area to be added:</p> <p>e.g.</p> $3(x+1)(x+11) + (x-4)(2x+2)$ $= 3(x^2 + 12x + 11) + (2x^2 - 6x - 8)$ $(2x^2 - 6x - 8)$ $= 5x^2 + 30x + 25$ <p>Factorising gives $5(x+1)(x+5)$</p>	$5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$	6	<p>M1 for attempting to subtract the area of small rectangle from area of large rectangle in A</p> <p>M1 for $3(x+1)(2x+7) - (x-4)(x+1)$</p> <p>A1 for $3(2x^2 + 9x + 7)$ and $(x^2 - 3x - 4)$</p> <p>A1 for $5x^2 + 30x + 25$</p> <p>M1 for attempting to factorise "$5x^2 + 30x + 25$" to get dimensions of B</p> <p>A1 for $5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$</p> <p>OR</p> <p>M1 for attempting to add the area of two (or more) rectangles that make up the shape A</p> <p>M1 for $3(x+1)(x+11) + (x-4)(2x+2)$ or equivalent</p> <p>A1 for $3(x^2 + 12x + 11)$ and $(2x^2 - 6x - 8)$</p> <p>A1 for $5x^2 + 30x + 25$</p> <p>M1 for attempting to factorise "$5x^2 + 30x + 25$" to get dimensions of B</p> <p>A1 for $5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$</p>
Total for Question: 6 marks				

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